Thesis Project Portfolio

A Floating Farm for Hydroponic Crop Cultivation in Small Island Developing States

(Technical Report)

Hydroponic Farming in Food Deserts

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

My technical work and STS research are connected by hydroponic farming, and exploring ways it can benefit different communities. Hydroponics is a farming technique that grows plants using no soil, taking up far less space and using less water. It provides a lot of benefits in plant quality, producing plants that have more vitamins A, B and E. Having stacked plants that aren't reliant on soil type allows for much variability in where farms can be grown. With this technology, there are discussions of ways to make farming and plant production more efficient and accessible in many ways. I used this opportunity to explore two ways that hydroponics can be beneficial for current problems. In my technical project, hydroponic plants were grown in a trapezoidal floating crate for Small Island Developing States and in my STS research, ideas of growing plants on city building rooftops were discussed.

For my technical project, a team and I worked on a floating hydroponic farm that will be used on Small Island Developing States. The farm was created with a goal of surviving natural disaster events, allowing these communities to continue having a food source while recovering. Beyond floating, this farm also allows for autonomous growth during natural disaster events. It comes equipped with a water collection unit, as well as solar panels that charge water pumps. Using an Ebb and Flow system with dutch bucket hydroponics, this farm can be watered with rainwater and solar energy. The solar panels also store extra energy, allowing for charging of a fridge for a short period of time after a natural disaster event. This was the fifth year of hydroponic farm creation, and the farm is fully ready to go. I believe there will be another capstone team on this project that will mostly focus on target group research to find the best place for this product.

My STS research also explores hydroponic farms, but is focused on poor urban communities of people who live in a food desert. A food desert is defined as a place without easy

access to nutritious foods. Many people in these areas live off fast food, and this research explored the idea of using hydroponic farms to combat this issue. Inspiration was taken from old hydroponic farms (in Babylon, China, ect.) and discussion of adding fish to the hydroponic system was discussed. Because hydroponics can grow in any conditions and any location, the idea of using roofs of apartment buildings was discussed. Hydroponics can be mostly autonomous, and the working of these farms could provide jobs for people in these low income communities. The idea has a lot of potential, but it would take help from a lot of key stakeholders (Government, non-profit organizations, locals) to make this kind of business model work.

Working on these two projects has opened my eyes to the potential of hydroponics. Even if hydroponics aren't used for one of the two issues mentioned above, I think they certainly can be used generally as a farming method. I also think that hydroponics will become prevalent in urban areas to both provide food for people, but also as an agricultural decoration. They have proven easier, more versatile and more nutritious than current traditional farming methods. Because they can be stacked vertically, they take up far less space than a traditional farm. From these projects, I have at the very least developed an interest in hydroponic farming and will certainly have a hydroponic garden at my house when I am older. I could even see myself working on the development of these systems. Overall, I am very grateful for the awareness and interest these two projects have casted onto me.